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FORMERLY THE AMERICAN GAS LIGHT JOURNAL

Vol. CXI, No. 12 NEW YORK, SEPTEMBER 27, 1919 Whole No. 3212

Making the Coal Go Farther

Advantage Derived from Consuming the Coal at One Point and the Heat Units Contained Therein at Another Point Miles Distant — Items of Waste that Mount Up

Bp L. W. ALWYN-SCHMIDT

The gas industry, by enabling us to transmit the heating powers of coal without the necessity of transporting the coal itself to each individual distribution point, fulfills a very important part in the economic life of our nation. There have been apartment houses in times before the gas industry existed, but it is not thinkable how a city like New York or any other of the large cities of the United States could have developed without the aid of the gas industry. It would have been impossible to provide for the cooking facilities of a house holding fifty and more families. The mere necessity of storing the coal would have formed an impediment that could not have been overcome. No other way of heating so far has been able to produce a solution for this very great problem. Electric power, which might do it, has proved too costly for ordinary heating and cooking purposes. Chemical heating processes, although known, are not sufficiently tried out to permit their use. Gas alone has all the advantages required for a fuel to be used in the modern apartment house. There is no necessity of carrying the coal or the oil many stories up in elevators. No space is required to store the fuel. There is no dust, no unnecessary cleaning. Gas does everything. It passes unseen to the stove; it is at hand at the turning of a cock. It is just as easily extinguished again when its services are not wanted.

These three accomplishments alone set it far above any other kind of heating we know to-day. The carrying of coal even in the small private house provides a continual source of waste of energy. Not only has the coal to be delivered in small individual quantities to the consumers, necessitating the employment of a truck, horses or motor power, and the attention of one or two men, but the unloading of the coal itself and the handling inside the house take much of the work of several persons that might be employed with advantage otherwhere. With the present servant situation it is practically impossible to handle coal in the ordinary household for cooking.

But let it be assumed that all these difficulties have been overcome, that the coal has been delivered and is ready in the kitchen for use. Now follows the process of laying and lighting the fire. Outside the loss of labor, there has been proven by scientific research that enormous quantities of heating values are lost every year to the nation by the lighting of fires alone. Not only are much larger quantities of coal burned than would be necessary, but it takes a while before the burning coal reaches its proper heating efficiency. Gas reaches its highest heating efficiency immediately. There is, therefore, no loss in this respect. Coal used in the open fire continues to burn when it has done its service. The fire has to burn down and during this time coal is consumed that might be used in another place. It might be wanted in another stove in the same house, but it cannot be carried there. The fire has to be relighted, resulting in the same loss of heating energies. The individual loss may be small. But it is a cumulative loss which attacks the economic life of the nation as a slow fever will attack the human body. The pound of coal which is lost in each stove in each household multiplies. As it multiplies it turns into wagonloads. It represents the work of several men working underground in the mines. It is one more car to carry over our railroad lines, and it is one car more to be delivered in the city.

True, the same car of coal may have to be delivered to the gas plant, but it will be used more economically and to better advantage. The pound of coal burned in lighting the fire will not be consumed, because gas immediately gives the highest heating value after lighting. It also is shut off immediately after having accomplished its purpose. There is no difficulty in transferring the action of gas from one place to another. A gas stove burning on one place may be extinguished by a turn of the hand, and at the same moment gas may be lighted somewhere else miles away. It is the same energy that burns in the new flame: nothing of the heating value is wasted.

The National Aspect

The nation is just now confronted by a very complicated problem of providing for the execution of its every-day work. Economists say that the national production declines; that we, in fact, produce no more the same quantities we used to, although the value of the production is rising. This no doubt is a very serious situation. It is bound to lead us to national debacle. In dealing with this problem we deal, unfortunately, with a matter which, as experience shows, does not lend itself well to scientific handling. This is the human mind.

A restlessness has come over each of us which expresses itself first in a certain dissatisfaction with ourselves and our surroundings, and later enters a state where it wishes to change the existing condition of things.

As to labor, it has now reached that stage where everything seems ready for a change.

Whether this change will lead to the better nobody knows; and the truth is, nobody cares so long as the change only is brought about.

Labor wishes to reduce its working hours. It looks for different spheres of activity and, having earned much during the war, it is willing to back up its opinion by strikes.

The logical result will be that the function of labor will have to be undertaken by somebody else.

An Historical Precedent

Men's minds seem to turn back to a similar condition somewhat earlier in the history of our time. Did not English farmhands rise and burn farming machinery? Were there not riots upon the introduction of the power loom because labor thought that these engines would deprive it of its livelihood? Has the situation now changed? Is the machine to rise in its stead and claim to take over work that labor declines to perform? Our great and outstanding problem, no doubt, is this: How can we lighten the load of labor? How can industrial work be made attractive enough to-day so to attract to its ranks new groups of workers who so far have abstained from taking a hand in direct production?

This is a problem which is as imminent in industrial life as it is in the home. It is, in fact, at the root of all our present social unrest.

In the industrial sphere of our economic existence the machine will no doubt provide the solution. It also will help in a similar manner in the home. But in each instance we have to provide at first for the basic and key industries before we can attempt to cure the evil higher up.

To employ machinery we need power to turn the wheels. And the largest part of this power is still the result of coal combustion. If we can save in the consumption of coal we shall also be able to save the human energy in other industries, because we can replace it by machine energy which we gain from the surplus of coal saved in other directions. Considering the enormous quantities of coal which are burned to-day in the households of this country, and the obvious fact that only a small part of this consumption is really essential under present-day conditions, it seems that a saving of coal in this place promises a good beginning for such a campaign of national coal economy.

It must be understood in this respect that saving and economy can always be of a comparative meaning only. If a certain household has used five tons of coal during half a year and suddenly needs only four tons, it saves the monetary and heating value of one ton of coal. If by some chance it should still use five tons of coal but heat three rooms more than before, it still saves coal, because it receives a higher return of the same quantity of coal. If we have, therefore, at our disposal 500,000 tons of coal in one particular district or ctiy and we are able to go along with 400,000 tons, we are doing very well in the matter of national economy. If we use the saved 100,000 tons of coal, however, for the purpose of increasing our industrial production in the same district, we are doing still one better, because we do not only save coal but we add to our wealth by making a better use of the rest. It is the latter form of saving and economy which naturally appeals most to the mind of the national economist. We must not reduce our total consumption of coal, but we must increase the economic value of that coal by making it go a longer way.

Making Coal Do More Work

Let us take the concrete case of a medium-sized city away from the coal fields which has to bring in its coal by railroad. To carry the coal means an expenditure of railroad cars and railroad service, in addition to the work of mining the coal and loading it at the pithead. Our city have have 2,000 households which may be lighted by electricity but where coal and oil—it does not matter which—is burned for heating and cooking. Each household in this little city wastes every day several pounds of coal during laying the fires and letting them burn down. At the rate of 2,000 households the waste may run into between two and three tons a day. To carry the coal to the individual consumers also represents a considerable economic loss. If this little city should have a gas plant it would have three tons of coal every day, which might be used for operating a factory or some other enterprise. Several situations may arise in such a community or in any other that has a larger coal consumption. The railroad facilities may become overtaxed with coal deliveries and coal may rise in price. Coal may not be delivered regularly because the dealers have no means of gauging exactly the demand of their community, and competitive purchasing is not always the best means of producing a well-balanced distribution and supply of any commodity. It seems that in such a situation the existence of a gas plant becomes a direct national necessity. It will relieve the railroad from the necessity of carrying more coal than is absolutely necessary, and by supplying gas to the kitchen ranges it will also release coal for other purposes. This may be taken in the mineral form or in the form of gas for driving a gas motor.

This takes into consideration the use of gas for kitchen purposes only. The use of central heating systems in the United States has done away with the more outstanding causes of coal waste as found frequently in other countries. It may be mentioned, however, in this connection that even in England, where coal is used quite generally for heating the rooms, and where it is burned in open fires, there is

hardly a community where gas is not employed for the kitchen ranges as a matter of course. The great conveniences of gas for the kitchen have driven coal from the kitchen in the very domain of coal heating.

Naturally coal and gas act in this respect always more or less as an adjunct to power production. The saving of coal in the home is effected especially for the purpose of releasing coal for industrial purposes.

The author does not wish to discuss here the relative merits of steam power, electric power and gas motor. This article is written merely to attract attention to the fundamental facts of coal saving as far as they refer to the gas industry. It is, however, clear that any saving of coal that can be effected in the American homes by replacing direct coal heating by gas heating must benefit immediately the power industry and must make possible in turn the release of great quantities of energy for the operation of additional machinery. The question arises, how can this energy, after it has been saved by an increased economy of the national household, again be applied in the most economic manner? We have to-day two principal forms of power generation, that by coal and that by water. Leaving aside the power generation by water, with its great possibilities, there is open to coal and its derivative, oil, the possibility of direct and indirect generation. Or, seen from the point of view of the gas industry, should we use coal directly for power generation or turn it at first into gas and burn it in this form? Where the transportation of coal inside the radius of the gas plant should prove uneconomical for the city household, as has been the case during the coal shortage a couple of years ago, the application of coal in the form of gas for industrial purposes has many advantages. As we deal here only with the gas end of the problem, we may leave out direct steam production and confine ourselves to indirect generation by gas. There is no reason why gas should not have been applied under the steam boilers of our industrial enterprises as readily as coal to-day. The same reasons which have recommended the use of gas in the much smaller economic sphere of the kitchen seem to recommend it in the boiler house of our large industrial plants. The choice of application appears to be only one of comparative economy. Is it cheaper to use coal or to employ its heating value in the form of gas? To make the example it would be necessary to take into consideration not only the direct cost of coal but also the cost of hauling and handling it, which would be eliminated in the case of gas. There is also the possibility of employing gas direct for driving a gas motor.

Coupling Gas to Electricity

The problem of indirect employment of coal in the form of coal gas becomes of increasing interest in its relation to the electrical industry. It has been pointed out already several times in former articles that the gas and electrical industries are really not competitors but are, in fact, supplementing each other. It also was shown that it is possible to produce a perfectly balanced unit of gas and electrical service which might take care of all the lighting and heating needs of one community at the least possible expenditure. The solution of this problem must depend upon its comparative cost. But we should not forget that coal burned under a boiler is lost to the nation after it has spent its heating value. It is the most uneconomical use of coal we can imagine. With the smoke untold and even not fully known riches of by-products leave the boiler which may be of enormous value for our industry and agriculture. If we can provide for the combustion of coal in one place and transfer the heating value to another, as it is done in the case of gas production, and save at the same time the by-products, we might supply gas much more cheaply to the electrical power houses than we can do now. At the present moment this by-product industry is still not sufficiently developed to permit a full study of the economics of the whole transaction. There is, however, no doubt that by splitting these products and resplitting them, as has been done already in several instances, many new products will be produced which in their total will repay completely the cost of manufacturing them, leaving at the same time a profit large enough so as to reduce considerably the cost of the heating unit to the consumer, be it an electrical station or any private boiler plant.

Economists have pointed out already that the solution of all the labor problems of the world lies in the provision of a cheap and, if possible, inexhaustible source of power that may be employed for driving industrial machinery and which operates with a small amount of attention only. Radioactivity has been pronounced as the possible source of that power. We know, of course, the enormous possibilities hidden in this wondrous element, but so far we have not learned yet to check it sufficiently to make it subject to the will of our engineers. There is much danger that we might blow to pieces our happy world by making a somewhat hasty attempt. We must, therefore, be satisfied so far with the more known sources of power, and coal seems to be able to serve us well for still a number of centuries. There has been some loose talk about the gas industry being outdistanced by the electrical industry. So far nobody, however, has proven why this should be, apart from the fact that electrical lighting and power distribution has entered some of the fields formerly held undisputed by the gas industry. Intended co-operation of the two is made impossible to-day by the conditions in the two industries, and in some instances by the operation of laws forbidding such a co-operation. While co-operation, therefore, does not exist in theory, it nevertheless does so already in practice. We have cities like New York where a perfect distribution of the service field has taken place which gives to the city the best possible service in power and light. Let this co-operation be still further extended to a point where the gas industry acts as the intermediary between the coal producer and the coal consumer, and at the same time saves to the nation the very important by-products. Then an ideal state of affairs is obtained. It is not at all unlikely that the gas industry may reach this point by its own exertion. An expansion of the by-product industry, resulting in a considerable reduction of the cost of the heating unit of gas as compared with coal, would force all coal consumers to employ gas where coal now is used.

Economy the Big Need — Economy Beginning at the Gas Standard Set and Running All the Way to the Cheapest and Most Efficient Consuming Appliance

John D. Kuster Would Have the Manufacturer Give the Gas Maker a Chance to Ease Up in His Constant Struggle to Decrease Cost of Gas Through Cheapest Production by Improving the Appliance So as to Decrease Its Cost Through the Least Consumption in Proportion to the Task

The industrial use of gas provides a field for much study in economical methods for production and use, declared John D. Kuster in his presidential address before the recent annual convention of the Pacific Coast Gas Association. In this State—California—candlepower requirements have been forgotten, and the heat value standard of 570 British thermal units has been adopted for manufactured gas. I am sure that all engineers do not agree as to what should be the correct standard.

Providing an Incentive to the Consumer to Use Gas Economically

In September, 1911, in a paper read before this association at Oakland, Past President E. C. Jones courageously advocated a 500 B.t.u. standard for oil gas on the theory of economy of oil and added efficiency at the appliance. Gas engineers throughout the United States are beginning now to appreciate the wisdom of giving some attention to fuel economy as a matter of conservation, and also beginning to realize that the efficiency of the appliance puts a premium on the intelligent use of gas. England has adopted a standard ranging from 400 B.t.u. to 500 B.t.u., as some industrials find the gas of the lower heat value the more efficient. For years great waste in natural gas has been permitted and encouraged by the authorities in making the price so low that there was no incentive for the consumer to think of economy.

Penalizing a Utility for Abandoning the Flat Rate Charge

It was only recently that one of the large cities of this State attempted to penalize a public utility for discontinuing the flat rate charge for electric lighting and the installation of meters, preferring to see the residences and streets beautifully illuminated in broad daylight, little caring for those who could, if permitted, make industrial use of the electricity being ignorantly and almost criminally wasted.

At the present time when the natural gas fields are almost exhausted, we find a willingness on the part of the authorities to think of economy in the use of gas, while all these years they have been giving their attention solely to pleasing the public and lessening the consumer's monthly bills. It is probably too late and a few years will see these thousands of natural gas consumers forced to use some other fuel.

With oil constantly rising in price, and the demand said to be such that without unprecedented production the storage supply in the United States is sure to be exhausted within 18 months, it would seem that this association should take some heed of the warning given at Oakland eight years ago, when Mr. Jones recommended a 500 B.t.u. gas for the sake of economy in oil. It would seem also that the conservation of oil is a thought well worthy of careful inquiry by our public utility commission should they consider revising the B.t.u. standard already adopted, and may they also observe that cheapness in rate of gas to the consumer does not always work in harmony with the conservation of oil, or efficiency in the use of the appliance. May not the consumer be permitted to share the responsibility with the utility in the necessity of conservation.

The consumer will need the assistance of experts in choosing his appliances and learning their economical operation. Whether the dealer or the gas company, or both distribute appliances to the consumers of gas is not material providing the consumer is given the best appliance, proper installation of it, correct prices, efficient service in operating it and a stimulating and active growth is maintained in gas sales.

I am inclined to the belief that all along the line from manufacturer, jobber, dealer, to the consumer, there is an expensive lack of efficiency.

How the Appliance Manufacturer May Make Gas Cheaper

Some manufacturers attempt to satisfy the whims and fancies of every salesman to supply different styles of ranges. Various sizes of ovens, doors, burners, warming closets, utensil cabinets and finish must compel a tremendous waste of capital in patterns and stock, warehouses and plant equipment. No such economy in the manufacture of many styles can be accomplished as there would be if each establishment confined its attention to one or two standard makes. We have plenty of examples of this practice in the automobile, electrical, tractor, implement, washing machine and other industries. The most successful example is the Ford automobile. Standardization is one of the many lessons of this great war. When there is so much need for economy why not begin in the right place to apply it. As the appliance is passed from the manufacturer to the jobber, from the jobber to the dealer, from the dealer to the customer, each has charged all the traffic will bear. And every dealer in every city in the United

States has a different method of accounting, different idea of cost of doing business, and consequently different prices for the same appliances.

If the manufacturer fixed the retail price, there would be forced economies all along the line, and uniformity in price to the consumer that would eliminate much of the unfriendliness among dealers themselves and criticism of his methods by his customers. By doing so, they would be again following the example set by the Ingersoll watch, Gillette razor, Ford automobile or American beauty iron.

Few great economical improvements have appeared in appliances during recent years. It can't be that manufacturers consider that the acme of perfection has been reached, and that there is no room for improvement. Or is it that they are so much interested in quantity production that they leave all efficiency experimenting to the gas companies, depending on the gas engineers to continue to invent gas generating apparatus, that will make a cheaper gas to be wasted in an inefficient appliance. For years past the eye of the authorities has been centered for economies in our gas engineers to produce a cheaper gas. There must be a limit somewhere. Let us give the gas engineer an opportunity to mop the perspiration from his brow, and ask the manufacturer of gas appliance to warm up to hi sjob.

How the Gas Company May Reduce the Gas Bill —and Profit Thereby

It is someone's duty to teach the public how to use gas economically. I believe that when a gas company dismisses its salesmen, it immediately looses interest in the efficiency of the appliances its customers use, and leaves to chance the most important element of good service, forgetting that there is a close relation between the inefficient appliance and a high gas bill, and a personal element of human sympathy in a representative of the utility commission for the consumer complaining of a high bill, that cannot help but be reflected in the rate schedule. I cannot sufficiently emphasize my belief that a good salesman thoroughly familiar with appliances, and alive to the needs of consumers continually mindful that inventive genius will produce more efficient appliances, is the most important and useful employee about the institution, and that he is the last man to be dispensed with in case of "stringent economy" orders.

We gas men must not forget that we are only trustees entrusted with a public duty, serving the public, a critical public, a majority of whom need tactful guidance and careful instruction, and to make sure that they get all that they pay for, have put "regulators" over us. Public utility regulation has developed into a permanent function in practically every State in the Union. No intelligent man doubts the necessity for such an institution, or doubts the sincerity of the commission, or the effort put forth by them to get all the facts and make fair decisions. This work has sprung up in a comparatively short period, and it takes time for the commission, the utility and the public to become educated to all the responsibilities of the new condition. Some of the old time politicians have been deprived of their campaign thunder and aided by certain financial interests, have made attempts to curtail the authority of the commission in this State.

They favored its creation because they thought it good politics to do so, and believed the only need of such a body was to regulate rates downward. When they found that the commission actually was compelled to consider the interests of the public the consumer and also the owners of the utilities and the investors in its bonds, they were disappointed and immediately began to take steps to nullify the utility law. Rather than diminish their authority, it would seem that our experience has convinced us that their duties and responsibility should be increased until it included regulation of all public utilities in the State, including municipal plants and regulation of the principal materials used by the public utilities, including wages of its employees. It is difficult for me to understand why oil or coal or labor should escape such official scrutiny, when they are practically the only elements used in gas making. We take careful and expensive inventories of gas property, the gas services and gas mains, and count the meters, the depreciation and earning value of this property being considered of such importance, but permit the privately owned oil company or the labor organization to make its own rates without question. We have instances of educated men standing on soap boxes, misguiding and urging the people to vote bonds in order to build a municipal gas works in a community where a privately owned one already exists. If the commission controlled the rates, the service, the accounting, and the financing of municipal plants, so that accurate costs and understandable records would be kept and made public, the tax payer and the public would be saved from much foolish waste of public money and the ability of municipalities to issue bonds would be utilized for such community purposes as sewers, streets, public buildings, schools, parks and playgrounds, and other enterprises of a community nature not supplied by private capital.

Municipalities Operating Utilities Only During Good Behavior

We have many examples of public utilities having been forced to sell its distribution and manufacturing properties very much against the wishes of the owners, because the property was well managed and profitable, and the municipality was led to believe that a money making enterprise could be easily and cheaply acquired, but the people later found that the average city council is seldom composed of trained gas men, and the money was extravagently or unwisely used in other departments of the city and not on the upkeep of the plant or improvements; that the service was poor and the rates high. When a forced sale is made of a public utility, the law should provide that the municipality may own and operate it only during good behavior, and that the property should return to its original owners when it was proved that the city government was guilty of inefficient management and antique methods of operation. This is just carrying out the American plan of justice and the square deal; either make good, or give up the job, applies equally to individuals, corporations and municipal ownership of utilities.

The public utility commission should be a sort of "traffic cop" whose badge of authority keeps everyone traveling the public utility highway, going in the right direction at the proper speed, and preventing smash-ups and disaster on the way. Labor, the oil or coal producer or the municipal plant has always been given the right of way and told to "use his own judgment" and permitted to exceed the speed limit, turn short

corners, run wildly into others, legally entitled to protection from smash-ups, tie-ups, congestion and general confusion. There should be no favorites. The ideal of service to the consumer, the security of the investment to the citizens whose savings are invested in the bonds of public utilities, the prosperity of the industry for its owners and employers, demands that we clothe our "traffic policemen" with new uniforms and arm them with larger clubs.

Making the Fire-Eating Anarchist Go to Work

It is a source of much satisfaction to the gas companies to know that they for one short period of their existence have not been charged with "profiteering." Oil, labor and all material have increased from 75 to 300 per cent, but the price of gas in many cities has not changed. In this State, increases from 10 to 20 per cent varying with different conditions and localities have been made, but in about fifty of the large cities of the United States increases have averaged slightly more than 1 per cent. The smallest item of family expense is the gas bill, and if all other institutions were satisfied with reasonable profits and exhibited as much of that spirit of "fellowship among men," and the "willingness to live and let live," as the gas companies, this nation would not now be faced with internal strifes and disorder, and the radical and the fire-eating anarchist would have to go to work, for no one would listen to him or work to feed him while he made night hideous with his rantings.

With the average rise in the past six years in this country of 91 per cent in the retail price of the actual food necessities of human existence, the salaried man and the wage earner has been busy in the science of high finance. Nine articles show an increase of over 100 per cent, namely, lard, 146 per cent; flour, 127 per cent; bacon, 110 per cent; corn meal, 107 per cent; pork chops and potatoes each, 106 per cent; ham and lamb each, 104 per cent, and eggs, 102 per cent. Other articles increased as follows: Sugar and hens, 96 per cent; butter, 89 per cent; round steak, 87 per cent; rib roast, 77 per cent; bread, 75 per cent; milk, 69 per cent. Every general increase in the wage scale has been followed by an increase in cost of necessities, and one wonders where it will end. All organized labor is better paid than ever before, and the question is whether the majority actually spend all they earn and are they forming habits of economy and thrift.

Keeping a Stiff Upper Lip Though Unable to Provide a Rainy-Day Fund

The salaried man or woman not a mechanic, and not a part of a labor organization belongs to the class of workers that is deserving of attention. If they have had increases, it has probably not averaged more than 15 per cent, while the men under them have had increases of 50 per cent. The chances are that he is drawing on his saving each month, and the mechanic in the shop is sporting a new limousine. Most of them have gotten along some way or other and raised a family on $150 or less per month. I marvel at the courage of men to keep a stiff upper lip and face the world with a smile when their earnings and more are used each month with no ability to provide a fund for his existence when be becomes "obsolete" or "inadequate" and must be thrown into the "scrap pile."

He is the man whose shift is limited to 24 hours a day, and 365 days a year. On duty always when needed, and sleeps with a telephone at his pillow. He carries on his shoulders the responsibilities of his company. He defends it against all criticisms and unselfishly glories in its success. He is called out nights, or holidays without a thought for overtime. He is loyal through strikes, despises dishonesty wherever he sees it, whether in the form of laziness of a worker on the job, a collector short changing a customer, a traveling inspector padding an expense account, or a complaint man accepting a tip. Organized labor takes care of itself, but the salaried man is sadly overlooked. He has the right to an annual income that will enable him to live well, buy a home with a few acres, permit him to educate his family, and by reasonable thrift and economy lay aside enough to enable him to make a living out of his little farm when "Old Father Time" hands him the "blue envelope."

The employees of public utilities generally come in closer contact with the public than the employees of factories or other industries. They are required to be courteous and polite, under irritating criticism of persons unable to intelligently criticise the service, rates or operating rules of the company.

The Employees of All Utilities Should Be Better Paid

The very nature of public utility work requires strict discipline and positive accuracy and reliability. For this reason the employees of all utilities should be better paid, should work shorter hours, should be better housed and have better working conditions than those of other industries. They could then be more carefully selected and permanent employment with the utility would in itself be a certificate of character and ability that would be a valuable asset.

Whether unionized or not, they should not be denied the right of collective bargaining if they desire it, and all disputes and differences that may arise that cannot be settled by representatives of the workers and employers, should be referred to the public utility commission whose judgment should be final, and who have the authority to make rates to justify generous treatment. The public is not concerned in the disputes that arise, but they pay for a service which the utility is obliged to render, and any person accepting employment with the utilities obligates himself to assist in making that service perfect. He forfeits his right to strike, or to even absent himself temporarily from duty without knowing that a trained employee is ready to take his place.

The recent telephone strike was a great economic loss to every industry for miles within the zone of its influence. The hardship and suffering of the injured and the ill in need of the services of physicians or hospitals, cannot be known or estimated in dollars.

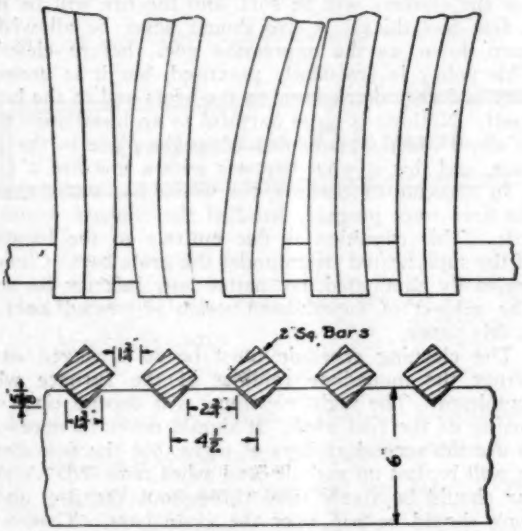
A great railroad strike would produce bankruptcy and ruin to millions. It would produce a condition of famine and starvation in many of the larger cities in a very few days, and endanger the very life of the nation. The greatest harm would come to the millions of other workers in all industries, trades and vocations, not associated in any manner with the railroads, except as patrons of its service; a service which the owner and employees alike have voluntarily obligated themselves

(*Continued from page* 275.)

Easily Effected Economies in the Retort House

Carl B. Wyckoff Begins with the Grate Bar Sections and Leads a Profit Producing Tour Through the Whole Works

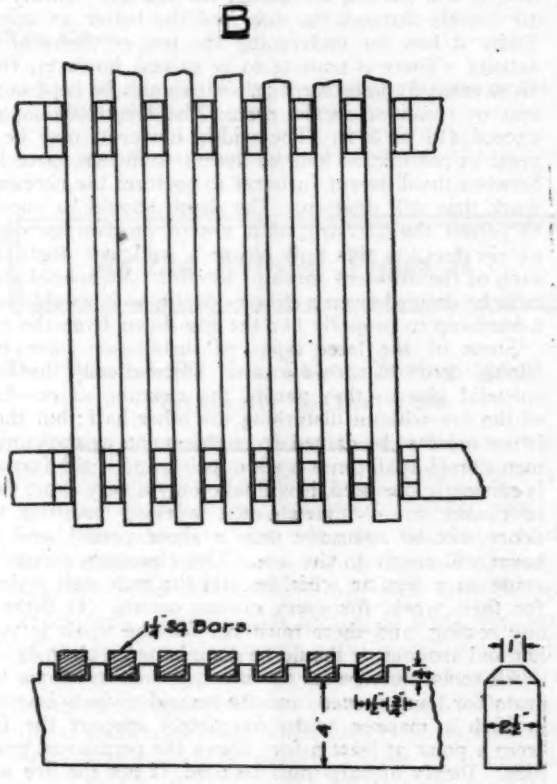
The retort house and its operation should be under the direct charge of an exceptionally competent man, for it requires the closest attention and the most constant care to secure satisfactory and uninterrupted results, declared Carl B. Wyckoff, superintendent of manufacture of the Grand Rapids Gas Company in a paper before the recent annual convention of the Michigan Gas Association. In addition to having had the proper experience, the operator must possess a fair amount of the technical knowledge of the business in order to appreciate and utilize the essentials necessary to successful operation.



Common Type of Grate Bar Rest

The efficient operation of a gas plant to-day is not so much due to new inventions or scientific knowledge not known to the average gas man, and the writer does not feel that he is going to be able to open your eyes along that line. He does feel, however, that with the ordinary gas plant there is considerable room for improvement and that some of the fundamental laws of operation are very frequently ignored. This does not refer only to the small plants, but to some of our medium sized properties as well. Often one finds the operating responsibility delegated down to someone who, while he may have worked around a gas works all his life, is nevertheless ignorant of all the laws of successful operation, and to whom a chemical term would be as Greek. The average foreman is a martyr to his work, and as a rule is willing to work until he drops; but how much does he know about making gas? He knows that you put coal in at one place and that gas comes out at another, if the stand pipes are not stopped. He is generally in trouble up to his neck and is so busy that he doesn't have time to think You will say that he does not run the plant, but that is the very point I wish to emphasize, because very frequently he does, and if your operating results are not such as to please you, it is suggested that you investigate and see if such is not the case in your own home town.

The responsibility of operating the retort house should be entrusted only to a capable and competent man, who, in addition to being worthy of the trust, should enjoy a just remuneration. The difference between the salary



Proposed Type of Grate Bar Rest

of a first-class man and an ordinary one is insignificant when compared with the improved operating conditions and the increased earnings.

Furnace Operation and Design

The furnace is the most essential part of the retort house, and we will discuss it first. The design should be carefully considered, whether it be a new one (to be built) or an old one already in operation, as it will be found there are quite a few that will bear improvement.

The prevailing mistake is in the type of grate rests. They are usually of the "V" notch type, which look splendid in the drawings but are a nuisance in operation. If the grate bars always remained straight, then it would be advisable to use them by all means, but this is seldom the case, and the consequence is that two of the bars will be about one inch apart, and the next one will probably be three inches away, or they will be

properly spaced at one end and spread out in the middle, or vice versa, as shown in sketch (A). The experience of the writer has been that a layout as shown in sketch (B) furnishes a more satisfactory arrangement. If during use the bars become bent downward, and that is the only way that they can bend, they can readily be straightened and replaced the same as they came out, and therefore the spacing will remain proper. This will permit the necessary shaking of the fire without the loss of good combustible fuel, and a clinker pile free from good coke surely speaks well for the operator.

The larger the grate surface, within certain limits, and with the proper percentage of air space that conditions will permit, the better, for the more slowly the air travels through the fuel bed the better an opportunity it has for undergoing the proper chemical reactions. There is nothing to be gained, however, from an excessively long furnace, as it cannot be kept in the best of condition in the rear. The length should not exceed 4½ or 5 ft. The width, however, may be as great as possible, so long as there is sufficient space left between the different furnaces to perform the necessary work that will develop. The depth should be enough to permit the carrying of a fire of an average depth of six feet, as this will insure a sufficient depth for each of the different zones of the fire. No special good is to be derived from a greater depth, as it would incur a hardship to properly bar the fire down from the top.

Some of the later types of installation have two clinker doors to each furnace. Theoretically this is a splendid idea as they permit the cleaning of one-half of the fire without disturbing the other half; but there is not much to be gained from this point, as the clinker men should at all times work in pairs, and if the furnace is efficiently operated, it will take only a very short time to clinker it. With two men working properly the doors will be open for only a short period, and no harm will result to the fire. The cleanings should be made on a regular schedule, and the men well trained for their work, for every minute counts. If there is any resting, and there must be, for the work is very hot and arduous, it should be done between cleanings.

All tools must be in readiness, the doors above the grate bar level opened, and the secondary bars inserted in such a manner as to completely support the fire from a point at least a foot above the permanent grate bars. Plenty of bars must be used, if not the fire will fall through between them. The construction of the doors must be such as to permit the proper insertion of these bars, and that is where the double doors cause trouble, because if not cared for, the framework between them will necessitate a space where a bar cannot be inserted, and will thus leave an opening through which fuel will fall. Any spillage of this nature will result not only in the loss of fuel, but will also reduce the amount of space for the ashes. It also discourages the cleaning of the fire The portion below the secondary bars must be free and open so that the work can be accomplished speedily and thoroughly, lest the supporting bars become too hot.

When the secondary bars have been properly placed and the permanent bars removed, the side walls should be cleaned free of all clinkers. If the fires are being properly operated, the clinker will be found to be soft and very easily removed. Enough of the ashes should then be removed to permit the placing of the permanent bars, and then the secondary bars removed, and the top doors closed. The ash pan doors are then to be opened and the ashes removed. There must be no delay in the removal of the ashes, as they occupy all the space under the bars and not only retard the ingress of air, but if allowed to remain too long will cause the grate bars to become too hot. The ashes having been removed, the primary air ports are hoed out, and the doors shut tight. In speaking of cleaning the primary air port the expression "hoed out" is used because that is the proper way, for if a shovel is used there is a tendency to push them back, and if care is not exercised the opening will become partially closed. During this whole operation the steam under the grates must not be shut off. It is not necessary and should never be done except in cases of extreme necessity, such as repairs to the steam line itself or the superheaters.

The work below being completed, the men should immediately go upstairs and bar the fire down thoroughly from the top, and see to it that all side walls are left free from clinkers. This can readily be done, for the clinkers will be soft, and the fire will be only a few feet thick. A fire should never be allowed to burn down, as the expression goes, before cleaning. This policy is frequently practised, but it is unnecessary and very detrimental to the heats and to the bench itself. Nothing is more harmful to an installation than to allow complete combustion to take place in the furnace, and this is what happens with a low fire.

In speaking of clinkers, the writer has stated that if the fires were properly handled the clinkers would be soft. This condition is due entirely to the handling of the superheated steam under the grate bars. Clinkers are easily eliminated, no matter how inferior the fuel. The subject of superheated steam is treated later on in this paper.

The cleaning schedule must be so arranged as to permit the immediate refilling of the furnace when completed. The night cleanings will depend upon the quality of the fuel used. It should never be necessary to use the secondary bars at night, but the fire should be well broken up and all dead ashes removed. A slice bar should be freely used throughout the fire, and a hook should be run over the grate bars. This, with the removal of the dead ashes, should keep the fire in good condition. The night schedule should be so arranged that the cleaning of each individual fire occurs as nearly as possible to twelve hours after the daily clinkering.

Iron and Brick Work

All iron and brick work must be tight. There should be a careful report made by the night men of any defects that may develop while the repair men are off duty, so that they may receive immediate attention the next morning. It is absolutely essential that the brick work be tight, and it is a very good plan to go over all joints and rake them out to a depth of about one-quarter of an inch and point them up with high temperature cement. This will cost a little money, but you will be well repaid, as they will not give any further trouble. It is absolutely imperative that all the air enter through the proper places and under perfect control, if efficient conditions of operations are to be secured and maintained. A periodical inspection should then be made to see that no leaks are allowed to develop. Plugs that are likely to have to be removed should have the inside

(*Continued on page 276.*)

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As the Journal Views It

Its Possibilities for Labor Saving Bring It Pertinently to the Fore

Between exorbitant wages and adequate wages there is a wide distinction. Labor cannot exist and perform its functions properly on wages that are less than adequate, and adequate wages for to-day to executives who have not readjusted their perspective must of necessity by their altitude seem exorbitant. And it must be said in truth that much of the friction labor meets with in obtaining its just rights in the wage scale is the suspicion engendered by its seeming inability to content itself with an adequate and ample wage when such is easily obtainable. Rather the spirit of getting things by compulsion, a spirit for the existence of which the employing class cannot altogether disclaim responsibility, is apparently so firmly fixed that the granting of an adequate and ample wage is to labor but a step in a contest for an exorbitant wage.

However the differences thus engendered may ultimately be adjusted, whoever wins out in the long run, we are to-day confronted with a situation wherein the mere lifting of a human hand costs an appreciable sum of money. Granting labor even an adequate and ample wage—and no man can be so mad that to him anything less could appear conceivable—the cost of everything wherein human physical effort is required is, judged by past standards, seemingly almost prohibitive.

It is no longer necessary to advise people to look

about to see if there is not some task wherein they are unnecessarily utilizing human effort.

Our industrial gas engineer will immediately cite us hundreds of incidents, doubtless is citing them daily to a wide variety of manufacturers, thus doing no inconsiderable service in the national weal in appreciably helping to produce goods cheaply even with high labor costs.

A field of inefficiency that is, strangely, by the gas man quite generally overlooked is that of garbage and ashes collection and disposal as practised in our cities.

These tasks are costly, in the aggregate, in a high degree and a very considerable consumer of labor.

The all-gas house would manifestly be accompanied by no ashes.

But the all-gas house as a general proposition, especially as regards heating, is, under existing gas prices, impractical.

It wouldn't be if the city dweller could be educated really as to how much in addition to primary fuel cost it is costing him to use coal; how much the delays to his surface railway systems the hold-ups due to blocked coal trucks add to their operating costs; how much it costs him individually for ashes and garbage collection and disposal; how much the health cost is added to due to the passage of refuse and filth through the city streets, the wear and tear on pavements due to the passage of such wagons and coal trucks, etc. One has to use his imagination very much to hazard a guess. Yet we are convinced that if all the extras were added on the last cost to the individual would be less, using gas at present prices, than it—if all used gas—is by using coal.

For garbage and refuse there is the gas-fired incinerator.

In most cities the residue from the incinerator could be profitably employed in the grounds about the house. In apartment centers, of course, there would have to be a vastly minimized collection system.

The history of industrial gas demonstrates that we cannot depend upon outsiders to nose into our progress to learn if gas cannot offer them some benefit. We must take the lesson to them.

So must we act in demonstrating the aid we can give in the matter of urban garbage and ashes collection and disposal.

One Advantage of a Gas Strike

Recently 135 gas workers employed by the gas company in Seattle, Wash., went out on strike.

Strikes are the order of the day in the gas industry as well as in all the other industries of the country.

Without considering the right or wrong or any of the disadvantages to the gas company caused by a strike of its employees, there is at least one most apparent advantage.

In Seattle for 36 hours the city was without gas and the company's 60,000 customers were put to it in hundreds of ways. Practically every home was involved and many of the industries. Fifty per cent of the restaurants use gas, and when the people flocked to them for their meals they were either turned away or compelled to stand in line at restaurants using coal ranges. So many of the people went home and built camp fires in their back yards. Newspapers went out on the streets with large hand set type—or else did not go at all.

In a thousand ways—some of them most serious—the regular life of the great city was interrupted and almost wholly upset.

But it's an ill wind that blows with it no good. The fruit venders profited—the mealless crowds in the city bought out the fruit stands and early in the evening they exhibited nothing but empty racks. And as a forcible reminder to its people, of what it means to them, the gas company benefited. It's the daily routine that makes up life. Undoubtedly the people of Seattle will realize the extensive and the important part gas holds in the daily routine of their lives. The by-product of the strike will undoubtedly be appreciation of the necessity that has been too long taken for granted.

The Wise Men of Neosho

The town of Neosho, Mo., is not large, but its business men are progressive and they have made money out of an idea. About ten years ago they conceived the belief that all of the stores of such a community combined might be compared to a large city department store. They found that if they would all advertise at the same time, in the same place and in a similar manner, they could make a more favorable impression.

Once a month, according to the plan, they advertised a "Special Sales Day" with a series of unusually attractive offers of merchandise, price usually being the basis of appeal to the thrifty farmer.

Thorough investigations showed that the special sales resulted in a 53 per cent increase in business on the special sales days, and business was not injured either on the days preceding and following the sales days. Varying gains were shown by the stores for Saturdays and week days other than the "Special" days.

Neosho has no free band concerts to draw trade. It gives nothing away. Its business men have proceeded on the theory that what the customer wants is good goods for the money and fair and friendly treatment.

So much for Neosho.

When all tell the truth, neither the community nor the individual will be commended for doing it. The public will take it as a matter of course.

Economy the Big Need—Economy Beginning at the Gas Standard Set

(*Continued from page* 270.)

to faithfully provide. Public opinion in a democracy creates the desire and necessity for the laws that govern our political and our social conduct, and this same patient and long suffering public must create the desire for laws that will make a strike or a lockout in a public utility, because of such disastrous consequences, a crime equivalent to an act of treason.

And this American public opinion, always sane and just, and governed by that wonderful American principle of the square deal, should see to it that just and humane laws are made and administered by a board of educated, sympathetic and unprejudiced men, with Federal authority to settle all deadlocks and act with the utility commissions of the various States to the end that service to the public will not be impaired pending settlement of their grievances.

Force is not an American principle, except as applied to the stability of the union, the observance of its laws, and its rules of conduct. Force, as applied by the radical element in labor disputes, has been imported from the discontented, pauperized factions in Europe, and they come here with a feeling of prejudice and hatred for all authority, all institutions, social, political and industrial. It is better for utilities to give employment to Americans and Americanized foreigners only, and while it may be a little more expensive and it may slow up development and rapid growth, it is substantial and sure.

It is ridiculous for employees to feel that industries exist for them alone, and it is just as absurd for owners and bankers to think that they are the favored ones of God's realm, and that all good things were provided in order that their families may enjoy leisure and all the luxuries of an extravagant existence.

If the banker or owner works six hours a day and five days a week, counting a game of golf Wednesday afternoon, it is little wonder that his employees question why they should work ten hours a day and six days a week. If the owner takes his living out of the business each month, and a substantial dividend from the profits at the end of the year, I am not surprised that the worker yearns for a share in the year's profits, as his monthly wage has been barely a scant living. He, too, wants a savings account, to sustain his old age.

Americanization Must Come

When a factory pays its laborers $5 a day, and a 24-year-old boy, president of the concern, $125,000 a year, there is an inequality out of harmony with the American sense of justice. To my mind these are the biggest questions before the world to-day, and the very fact that owners are beginning to show a willingness to discuss them and correct them, are evidences that they will be peaceably and justly settled if the radical European malcontent with distorted philosophies, hysterical, and impatient of American calmness of discussion and evolution, is either Americanized or returned to the land that is responsible for his ignorance and criminal instincts, and permit Americans, grown up in liberty-loving America, with love for its form of government, and knowledge and sympathy for all its political, social and economic institutions, to settle their own differences in their own peaceful way.

The selfish instincts in all humans of whatever race, nationality or station in life must be subdued. The Americanization of the American employer, jointly with the Americanization of the American employee, must come before we can begin to think of Americanizing the confused, misguided and improperly educated European, who has come here for freedom, but has not learned that our ideas of freedom for the individual are associated with the rights and needs of other individuals in the community for health and happiness and the pursuit of a comfortable existence. Aliens should immediately adopt our language, dress and habits of living, eat the kind of food we eat, adopt our habits of social life and conduct, educate their children in our public schools and begin at once preparation for citizenship in the new land they have voluntarily adopted, or return to the land of their birth.

The employer and employee must both learn that each have rights which will bring greater prosperity to all if these rights are respected.

The wage earner is principally concerned in what he calls a more equal distribution of the profits. He forgets that frequently there are no profits, but he gets his wages just the same, and his employer pockets his loss and says nothing.

He is concerned in shorter hours, better working conditions, accident compensation, health insurance and safety laws, all of which the employers are beginning to accept. The one vital principle the employee has not yet learned is that careless inefficient workmanship, loafing on the job, curbing output, incomplete knowledge of the work to be performed, just "getting by on a bluff," disloyalty and indifference to his employer's interests are all forms of dishonesty, and are destructive to the prosperity of an industry, the reputation of a public utility or the life of a nation.

When Proved Unfit for a Mechanic or Agriculturist, Time Enough to Make a Lawyer Out of Him

The correction of this evil in adults can be accomplished only by personal reward in some form; yearly bonus for continuous service; frequent promotion; cash prizes for evidences of extraordinary skill; public acknowledgment of superior skill or talent; selection of skillful workers as instructors of those less skillful; encouragement to study at home or in night school in subjects allied with the daily work. To prevent the continuation of this fundamental error in the rising generation, we must enlist the service of the public schools. Education in its broadest sense must be compulsory and vocational; they must be taught to work with the hands, and when a boy is physically or mentally unfit for a mechanic or an agriculturist, it is time enough then to try to make a lawyer out of him, but the selection of his vocation or profession should be made by a board of vocational experts, and not by an indulgent mother or a whimsical maiden aunt.

If this nation is to compare favorably with other nations, its industrial and mechanical engineers and chemists must write into the patriotic exercises of young and old something more than singing the "Star Spangled Banner"; they must breathe into the souls of men and women through home influence and school training, a yearning for knowledge and superior skill, discipline and obedience, and enthusiasm for thoroughness, a heroic worship for creative imagination in work to im-

prove industry, and a realization that any vocation or trade becomes a profession whenever a worker puts a sufficient amount of knowledge, skill, enthusiasm and imagination into his work.

A public utility, monopolistic in its function, as it should be, practically guaranteed a reasonable return on its investment, seems to me to be the ideal institution for setting the standard of conduct, for both owners and workers, for character building and citizenship, for work and recreation, and for the security of the health and old age of its men and women.

Easily Effected Economies in Retort House

(*Continued from page* 272.)

of their flanges covered with high temperature cement before they are placed in position. They may then be pushed in tight and their edges pointed up. This will insure a permanently tight joint and one that may be readily removed. Fire clay is poor material for this work, as it contracts, and when the water evaporates from it, soon crumbles and cracks and allows the air to enter. It is sometimes considered that leaks in the plugs and the sight holes in the waste gas flues are not detrimental so long as there is sufficient draft. This, however, is an error, for such leaks certainly affect the Orsat tests on the waste gas, and where the operator is making his adjustments by the appearance of the heat of the waste gas flues, it will render that system of operation impossible. More will be said on this point later on.

Leaky retorts cannot be tolerated. With the present quality of high temperature cements on the market, they can almost always be repaired while the bench is under operation, and it is wonderful what can be accomplished along that line. However, should it be impossible to make the repairs while the bench is under fire, it should be let down and allowed to receive the proper attention. Very frequently patches do not hold, because they are too hastily applied. When a large hole is to be repaired, it is necessary to proceed slowly. The patch should be applied in layers. Each part of the patch must be allowed to set a sufficient length of time for the patching material to become heated to the point of vitrification before the next layer is applied. It will readily be seen that the patching of a large hole cannot be rushed. This is a tedious job, but when once done properly will last a long time. In patching cracks the surface is frequently not sufficiently cleaned. This is necessary to insure a good job. If accessible, compressed air will be quite a help in preparing the work.

Leaky iron work is inexcusable, for it can be readily repaired. When a leaky door does appear, it should receive immediate attention, and you will always have them under control. There should be certain men whose duty it is to look after this class of work, and their routine should never be interfered with. Leaky doors are almost entirely due to carelessness, and with the proper precautions can be kept at a minimum. Much damage is frequently done to the mouthpieces in scurfing retorts and burning stand pipes by allowing the iron work to become too hot. In scurfing, the mouthpiece door should be left wide open. Burning of stand pipes is a bad proposition at the best. Theoretically it should not be necessary, but unfortunately in practice it has to be resorted to at times, even in the best managed retort houses. It is in this operation that all the damage is done to the mouthpiece. The pipe man should not leave the job while burning out the pipe, nor should the mouthpiece be allowed to become too hot. There is a great tendency on the part of men to get this iron work red hot, and it requires constant watching on the part of those in charge to prevent this abuse.

Leaky mouthpieces are also due to their doors not being kept clean. If they are allowed to become dirty, they become hard to shut, and it then becomes necessary to use undue force. This eventually results in a broken mouthpiece lug, or at the best a bent cotter bar. Next to occur is a leak which being ablaze heats up, burns off a portion of this heavy accumulation and causes the leak to grow greatly in size. If not cared for, the iron work then becomes warped. The only sure way to protect the iron work is to see that all leaks are mudded up as soon as the retort is closed after a fresh charge is made, and before the next retort is drawn. Small leaks will readily stop themselves if not allowed to burn, but it is a small job to properly stop them, and you will insure against future trouble. Nothing looks better than a clean row of mouthpieces, and nothing worse than the opposite.

Scurfing Retorts

Scurfing must be done systematically, as an accumulation of carbon must be avoided. It forms a serious obstruction to the passage of heat through the walls of the retorts, in addition to reducing the capacity for coal. It is not possible to entirely prevent the deposit of carbon on the walls of the retort, but there are many conditions that augment this deposit, if not prevented. The retort should be filled as nearly full of coal as possible, for the smaller the gas space left the faster will be the travel of the gas, and consequently it will have a lesser opportunity to break down. This point is of great importance. Of course, the larger the charges the more gas will be made per retort, but the principal reason for large charges is to avoid undesirable chemical reactions from taking place. The carbon that is deposited upon the walls of the retorts comes from the breaking down of the heavy hydrocarbons. These gases are those that are the most desired to be preserved, as they are the richest. When allowed to become broken down they change from a highly desirable gas to solid carbon and gases of much inferior quality.

Irregularities in the pressure of the gas in the retorts assist considerably in the formation of carbon. Of course, the oscillation of the gas due to the overcoming of the seal of the dip pipe cannot be helped, but otherwise an even condition must be maintained upon the retort. In addition to the necessity of maintaining an even vacuum on the hydraulic main and an even seal on the dip pipes, the bridge and stand pipes must be kept clean, for they are very commonly the culprits in the case.

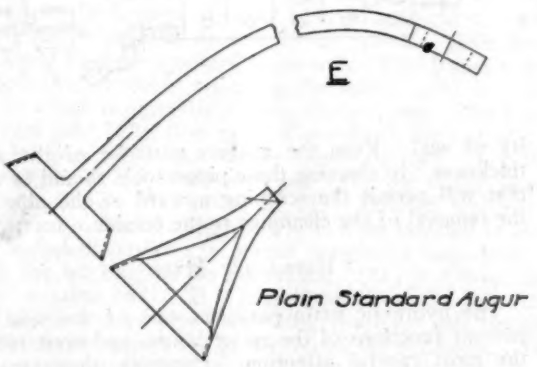
Scurfing retorts is a job that cannot well be rushed without risking damage to the retort itself. Fortunately the coefficients of expansion and of contraction of carbon and silica or fire brick are materially different, therefore, if the retort is left open a sufficient length of time the carbon will cool, and in doing so will contract to such an extent that it will loosen itself in a manner that will permit its ready removal. If not allowed to accumulate, its removal is not a serious matter.

There are several other systems for the removal of carbon, but they are more or less injurious to the retorts.

Stand Pipes

Stand pipes must be kept free and clean, since there is nothing that will cause more trouble than partially stopped stand pipes. When in the proper shape the heat radiates freely from them, and they help very materially in reducing the temperature of the gas. This will greatly assist in the prevention of hydraulic main troubles. Clean pipes materially contribute to even pressure conditions on the gas while in the retort, and this has advantages as previously explained. Most important of all is the fact that clean pipes will not become stopped. The large area permits the gas to travel freely, and the slight condensation due to the cooling of the gas has its desirable effect.

Stoppages in stand pipes are due to several different conditions. High heats have the following effect: During the first part of the carbonizing period the gases come from the charge at a much lower temperature than in the latter part, and it is during the former period that most of the tar is distilled. This tar condenses to some extent upon the inside of the pipes and adheres to the previous deposits. Some solid particles are naturally carried along with the gas, and these mix with the tar. During the latter part of the carbonizing period the gas is excessively hot and some carbon is liberated from the breaking down of the gas, and this carbon also mixes with the previous deposits. The principal trouble, however, is that the excessive heat of this gas dries out the moisture from this collection and leaves a hard crust which continually gets harder and harder. These actions are repeated with each charge so that it is not a long time before the area of the pipe is greatly reduced, and the smaller the opening in the pipe the greater the rapidity of this action. Low heats will also cause their troubles, in the nature of a formation of thick tarry matter. This is not so difficult to remove. Uneven conditions in the hydraulic main are also serious trouble makers. Variations in conditions above water level as to pressure and vacuum, tar seals allowed to accumulate, and all undesirable conditions cast their reflections upon the stand pipes.



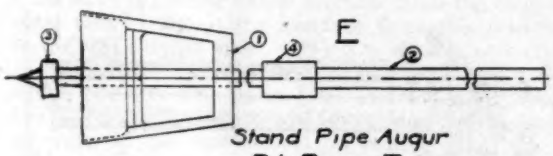
Plain Standard Augur

Stand pipes should be augered thoroughly just prior to each charge with a reamer one-half inch smaller in diameter than the pipe itself. This, of course, is done from the bottom. They should also be reamed all the way from the top down once each day or every other day. This is rarely done, but if the custom is once adopted it is remarkable how easy it will be to do this, provided the proper conditions are maintained elsewhere. The work of augering at each charge will become only a matter of routine, for there will be no accumulations.

Two types of augers are shown in sketches "E" and "F."

Sketch "E" represents the ordinary ring auger as used in all retort houses.

Sketch "F" shows a type known as the "PILE DRIVER." The feature of this auger is its value in cleaning partially stopped pipes. It consists of ¾-in. pipe (2) with lugs (3) and (4) welded on same. Ring (1) is so arranged as to fit over handle (2). This arrangement allows the lifting up and down of the handle for a space of one foot without moving the cutter ring. The lugs (3) and (4) upon the handle furnish the necessary weight to give a hammer effect, the top one being of value in forcing the auger down, while the bottom one assists in loosening when it becomes stuck.



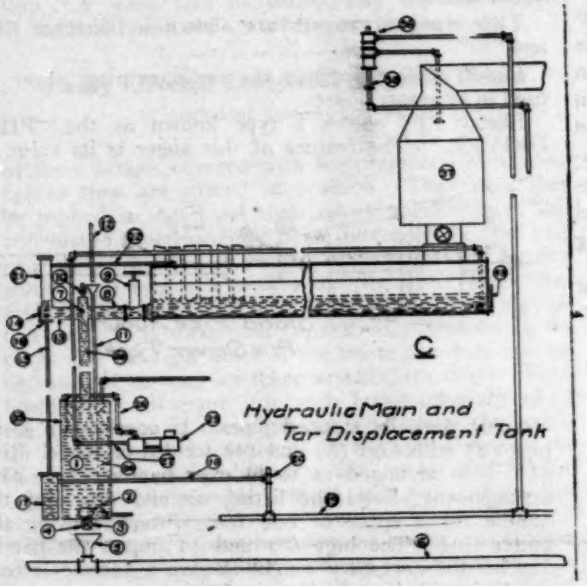
Stand Pipe Augur
Pile Driver Type

Care must be exercised in the installation of stand pipes. The proper amount of room must be left for expansion. Either too much or too little is bad and will cause continual trouble. If not enough space is provided, the hydraulic main will become tilted or the mouthpiece pushed loose, or, as frequently happens, both conditions develop. On the other hand, if too much space is allowed a proper and lasting joint cannot be made, and the result is that leaky joints appear which allow a loss of gas when there is a pressure inside the pipe, or when the bridge cap is raised air will be drawn through these leaks, and thus frequently cause the ends of the pipes to become hot enough to either get out of shape or burn off. This condition will not only seriously affect the augering of the pipe, but will cause a joint to develop that cannot be kept tight.

Considerable vigilance must be exercised in the burning out of pipes. They must not be allowed to become hot enough to show color. This intense heat is not only not at all necessary to burn out a pipe, but is detrimental.

In making the joints, the pipes should be placed in position, spaced with small pieces of wood, and left that way until the bench has been brought up to a working heat, and only after the pipes have become sufficiently heated for their maximum expansion to take place should the permanent joints be made. The bottom of the bottom pipe may be allowed to rest at a full depth in the bell of the mouthpiece. This joint should be made with first a heavy roll of asbestos rope well

packed into the joint; next there should be a layer of desirable filling material which will fill up the bell to a point about one-half of an inch from the top. The balance of this joint should then be filled with rust joint material. This is the most particular joint in the stand pipe, and if properly made at the start much future trouble will be avoided. The top joint should be made



similarly, only enough space must be left here for the expansion and contraction. It is better not to use a rust joint. There will be but little expansion and contraction taking place except when the bench is being brought up or let down; however, the joint must not be made rigid.

Even when the best care is exercised, the old style stand pipes form the greatest source of loss and trouble in the retort house. There have been developments in the improvement of these pipes that when properly installed eliminate to a great extent the worries of the old style installations.

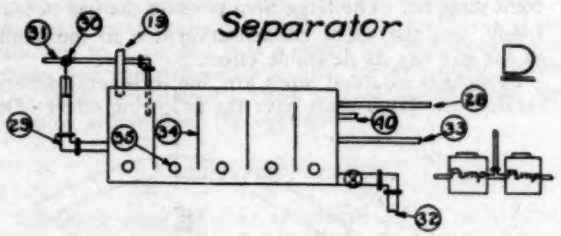
In the two preceding paragraphs the writer has in mind the washer-scrubber stand pipe system. This type of installation has now distinctly passed the experimental stage and is being quite extensively adopted. They are well worthy of careful consideration, and the writer is sorry that the length of this article compels him to leave out the proper description of such an installation. Their discussion, however, is invited, and it is hoped that their merits will thus be properly emphasized.

Bridge Pipes

There is very little to be said of the bridge pipes other than that they must be designed so as to permit a ready and free access not only to the bridge pipe itself, but also to the stand and dip pipes. The entire top half should be removable. They should be cleaned once a week, and that often will usually suffice. Care should be exercised in the cleaning so as not to allow the accumulations to drop either into the stand pipe or into the hydraulic main. Frequently hydraulic main troubles are due to this carelessness. If the accumulations are allowed to fall into the stand pipe, they will be revolatilized and again condensed back into the bridge pipe, or worse than that, in the hydraulic main. Therefore, all accumulations should be removed entirely and carried away.

Dip Pipes

Dip pipes must of necessity be all the same length, for nothing must be allowed to detract from a uniform-



ity of seal. Even the gaskets must be of the same thickness. In cleaning these pipes, tools should be used that will permit the scraping upward of the pipe and the removal of the cleanings to the outside.

Hydraulic Main

The hydraulic main performs one of the most important functions of the retort house, and must receive the most careful attention. However, they are frequently found to be sadly neglected. They are often covered with about a foot of tar, or are about half full of pitch, and their general appearance is that of a ship in distress in the trough of a deep black sea. Of course, they must be perfectly level, and if not so this should be cared for at once. They should be cleaned daily, and if proper conditions are maintained in the plant this will not be a bad job. Sketches "C" and "D" show one very successful system for operating the hydraulic main and its accessories.

The displacement tank system is a very satisfactory means for handling the tar. No smaller piping than 6-in. should be used, and all angles in the pipe line should be reduced to a minimum. Wherever it is absolutely necessary to have angles, crosses should be used to permit ready access for the cleaning of the line in both directions.

(1) shows the tar displacement tank, which should be of sufficient capacity to contain the tar production for a period of 24 hours, as it is a nuisance to have to drain the tank more often.

Manhole (2) should be placed as near the bottom as possible, and should be of sufficient size to permit periodical cleanings of heavy lumps of pitch that will accumulate in the bottom of the tank from time to time. An elliptical shaped opening is best, as it permits a wide opening which is not unnecessarily high, for it is the

width of the opening that facilitates the work of cleaning.

(3) and (4) are 6-in. nipple and valve for draining the tar from the tank.

(5) is a funnel connecting to the main tar line leading to the tar well. This funnel contains a removable strainer which is used to prevent any large lumps from getting into the tar line and causing stoppages.

The operation of the tank is as follows: When it is put into operation, valve (9) is closed, vent cock (10 opened and the tank filled with water from water line (12) through filling pipe (11). Pipe (11) must extend to a point higher than that at which the water level in the main is carried. This being completed, vent cock (10) is closed and the valve (9) is opened. The action will then be as follows: The tar forming in the hydraulic will flow out through valve (9), and when it comes to cross (7) it will, being heavier than the liquor, descend into the tank and thus cause the liquor in the tank to rise upward and through the 6-in. pipe (13).

(14) is a 6-in. cross containing a six by three bushing in the bottom. (15) is a 3-in. pipe which has a thread upon the upper end of sufficient length to permit it to be screwed up through the six by three bushings in the bottom of cross (14) to a height at which the dip pipes are desired to be sealed. This depth should be three-quarters of an inch. This forms a very desirable means of adjusting the seals. (16) is a lock nut which permits the packing of this point. The liquor from pipe (13) rises up and overflows the top of this 3-in. pipe (15) and thence down through (15) into seal pot (17). From seal pot (17) the liquor passes through pipe (18) into pipe (19), through which it is carried to the separator. (20) is a tee inserted in some convenient position to permit occasional inspections as to the working of the apparatus. (21) is a 6-in. riser from cross (14). It is capped tightly at the top. Line (22) is a 2-in. pipe connecting from the side opening in the riser pipe (21) to the top of the hydraulic. This is a pressure equalizer and must be kept open at all times, for if it is allowed to become stopped, it will cause the main to syphon. This line must be open, therefore, for if changed the level of the seal will be affected. (24) is a steam heating coil. The temperature of the contents of the tank should be kept at about 90 deg. to permit the easy flow of the contents. This temperature is best maintained by the use of exhaust steam with an orifice somewhere in the feed line to regulate the flow of steam. Too much heat will pitch the tank, and this point must be cared for as well as that of letting it get too cold. Further, it is desired to maintain a reasonable temperature in the circulation system, and any unnecessary heat will have an undesirable effect upon same.

(25) is a circulating pump installed in duplicate and preferably of the electric centrifugal type. Its suction line (26) is connected to the top of the displacement tank. Baffle plate (39) is installed in the tank between this suction pipe connection and the tar inlet (46) in such a manner as to prevent the tar from being picked up by the circulating pump. The discharge pipe (27) from circulating pumps is carried to the end of the hydraulic main furthest from the overflow. This pipe is placed down through the main and pointed toward the overflow. A rapid circulation insures a thorough flushing of the main. Tar itself travels too slowly and sluggishly, and thus this flushing will keep it from remaining in the hydraulic, where the temperature is high, long enough to give up its lighter oils and thus pitch.

This circulating pump and others mentioned in this article should be installed so that their suction inlets will be several feet below the point of the source of supply, as the liquor to be pumped is usually more or less heated, and it will be found that the pumps will cause little trouble if there is a pressure on the suction side instead of a vacuum.

The sizes of the different pipe lines referred to will, of course, vary with the size of the installation, but should be no smaller than those specified.

Sketch (D) shows the arrangement of the auxiliary separator. This separator can be of a convenient rectangular shape, but should have a capacity equal to double that of all the different hydraulics for which it cares. (19) is the liquor overflow from the displacement tank. (28) is the overflow from this separator to the weak liquor well. (29) is a suitable connection to the side of the separator for the action of a float which operates float valve (30) in fresh water supply line (31). This system will insure a sufficient supply of water in the separator at all times. (32) is a tar drain from the separator. Ordinarily there should be no tar in this separator, but it should be watched, as some may get in at some time or other, and should this occur and it not be drawn off, it would cause considerable trouble in the circulation system. (33) is the suction line to the circulating pumps. These pumps should, of course, be installed in duplicate. The separator should contain baffles (34) and clean-out plates (35). Ordinarily there should be no tar carried into this apparatus, but it is well to provide for it, as conditions may arise at times where the separating effect will be necessary.

The discharge from these circulating pumps passes through a flow equalizer (36) and into a small scrubber (37), which is installed in the gas off-take from the hydraulic. The flow equalizer is constructed with two six-by-two tees connected together with a 6-in. nipple. An orifice is inserted in the discharge line from the circulating pump as shown at (38). This orifice is sufficiently large to supply more liquor than will pass through the 2-in. line to scrubber from the lower opening. The excess will rise up and overflow through the side opening at the top and back to the separator. The flow is adjusted so that this top overflow does not equal the full capacity of the pipe, and in this manner, together with a speed regulator on the pump, the flow of water is always the same, for the pressure of the pump does not affect the supply to the scrubber, this pressure being at all times derived from that thrown by the head of water in the flow equalizer. All such matters are worthy of attention and should be under control, for should the amount of circulating water fluctuate it would cause a consequent fluctuation of the level of the water in the main.

(40) is a connection at a point below the level of the liquor in the separator for the purpose of drawing a continuous amount of liquor from same. It is not desirable to allow the liquor in the hydraulic main to become too strong, therefore it is advisable to drain a continuous quantity from the main and thus have it continually replaced with fresh water. The amount drawn off, of course, will depend upon the strength of the liquor in the separator.

(48) shows a convenient method for determining the level of the water in the hydraulic main. This consists of two regular boiler gauge cocks with a gauge glass between them. The arrangement is placed either on the end of the main or on the side at the extreme end farthest from the overflow. The lower connection is made at a point above which tar may be and below the top of the liquor. The upper connection is near the top of the inside of the main. A solid substantial flat iron strap is fastened to the main in such a manner that its position is permanent with relation to the main itself. This strap is just behind the gauge glass. The exact level of the bottom of the dip pipes is then plainly marked on this strap, and then one can readily determine the amount of seal. The seal maintained should be at least three-quarters of an inch for safety. A second mark can then be made above this previous mark, and one can tell at a glance if the seal is correct. This glass, of course, will not remain clear, as the gas pressure is against the top of the water inside and some tar will condense in it; but it is a simple matter to drain and flush it out. This arrangement is also handy for leveling the main if a duplicate is placed upon the other end. The gauge by which the seal is adjusted should be, as before stated, the farthest from the overflow, as in that location it will show up any stoppage that may develop anywhere through the length of the main.

The amount of the seal is of no serious consequence, provided it is sufficient to insure the proper sealing of all pipes at all times, and provided it is always exactly the same. Of course, there is no reason for an excessive seal, but there are apt to be interferences with the circulating system, and in such cases were the condition to remain unnoticed for some little time it would be possible for the water in the hydraulic main to evaporate to such an extent as to uncover the dip pipes. Three-quarters of an inch is, in the writer's opinion, the correct amount to carry, but if more should be desired the resistance thrown upon the gas in the dip pipes can readily be overcome by an extra vacuum on the exhauster.

Of course, the oscillation of the gas in the retorts must be reduced to a minimum, as we are all familiar with the deleterious effect of same. Therefore, such conditions must be considered in arriving at the proper depth of seal for different plants, as the relation between the capacity of exhauster and plant vary materially.

Once the seals are set the vacuum at the exhauster can be so adjusted as to maintain a vacuum at the outlet of the retort house governor about 1 in. greater than the inlet. The vacuum at this latter point can be determined by the quality of the gas desired. Ordinarily this vacuum should be one-tenth greater than the depth of the seal. When these conditions are adjusted, they should not be changed except when it is desired to alter the quality of the gas. When qualities of the gas change without adjustments being deliberately made, one should make a very thorough investigation for the source of trouble before changing anything, for there are many conditions that can arise in a plant which may affect the quality of the gas.

Drafts

The inclination on the part of the construction companies of late has been to install numerous dampers, many of which, as a rule, are unnecessary, and some of which are at times confusing. On the ordinary bench of retorts five dampers are sufficient, one being the main stack damper and the other four for the distribution of the draft throughout the bench. The main stack damper should at all times be wide open when the benches are heated up and working. It is very handy to use in heating up or letting down the bench, as the process can be carried out without disturbing the other dampers. If the installation contains any other than these five, they should be opened wide and forgotten.

The four distribution dampers should all be opened the same distance and so set that there will be the slightest pressure in the combustion chamber between the middle retorts. Then, if the bench does not heat evenly, and the flues are all found to be clean, the distribution dampers may be adjusted to care for the existing conditions. After the heats have been balanced and all parts of the bench are the same, if any changes are to be made all dampers must be changed the same. However, when once a bench is properly adjusted it is rarely necessary to change a damper, for if conditions change it will usually be found that something has occurred that is affecting the proper operation and that when such trouble is found and corrected conditions will revert to proper shape without a change in dampers.

The test for draft should be made at the sight hole in the center of the combustion chamber between the middle retorts, and is easily made with a small flame. It can be readily noted whether the flames are drawn in or forced outward. As previously stated, there should be the slightest pressure possible at this point. Too much draft will cause a great waste of generator fuel, as the heat will pass too rapidly through the setting to be properly absorbed. Further, if there is any opportunity for by-passing any particular section, such action will take place; while if the setting is subjected to a slight back pressure, the heat will be forced to all parts equally.

Primary Air

As previously stated, the brickwork of a bench must be sufficiently tight to insure against the entrance of primary air at any other point than the openings provided for that purpose. These ports should be constructed of the square slot type and must be installed in such a manner that the air can only enter through the slots. We thus have an arrangement that will permit of the most minute adjustment.

The primary air should be introduced into the bench through the injector effect of the superheated steam. This will insure an absolutely even supply at all times, as with this system one is not so much subjected to the vagaries of atmospheric conditions as when depending entirely upon natural draft. As previously stated, the subject of superheated steam is described later.

The amount of primary air required will, of course, be dependent upon the size of the installation and the condition of the different units under operation.

Theoretically, the amount required for different benches of the same size and type should be the same, but this will not prove out in practice, as it seems that benches are creatures of temperament and that conditions upon which one bench will thrive may cause a serious case of indigestion with another of the same identical type. While this statement may be exaggerated to some extent, it is true to a considerable degree. Sufficient to state that there is one and only one certain amount of primary air required for each individual bench, and this can be determined only by actual operation. Too much is more harmful than too little.

In readjusting a bench it is best to start in the following manner: First, see by all means that the furnaces are clean and free from all clinker, even if the fires have to be removed in order to do a thorough job. This first removal of the fire is excusable, but it should be the last time that it should become necessary. Clean and proper working conditions of furnaces being secured, the primary adjustment should be so made that it is a certainty that the amount of supply is insufficient for the requirements of the bench. This is the best starting point. The drafts and other adjustments should then be made to conform to this amount of air, and left so until sufficient time has elapsed to demonstrate just how much heat will be produced by these adjustments. The primary air should then be increased slowly until the proper conditions are secured. This work cannot be rushed for it takes time for the changes to produce their maximum effect, and if changes are made too often, one finds a condition arising wherein he does not know what he is doing. Also, with large installations it is found that with too abrupt or decided changes the flow of gas through the installation will be disrupted. It has been found best not to alter the primary adjustments more than one-eighth of an inch at a time. In serious cases it would not be bad if necessary to make several of these changes in one day, but they should be made several hours apart; extenuating cases in this part of the operation should not arise. Therefore, under proper conditions the primary air should not receive more than one of these adjustments per 24 hours, and preferably only every other day. The latter system will insure that the maximum efficiency has been derived from the previous adjustment. Of course, when there are changes made in the primary air supply, the other adjustments throughout the installation will have to be balanced.

The only loss in operation of the installation due to an insufficient supply of primary air will be in the capacity, provided, of course, that the bench is properly balanced. As it is understood that this is only a temporary condition, and that it is being improved daily, there should be no cause for worry or impatience. This procedure, though seemingly slow, is the only way to arrive at the most desirable conditions, and will not consume over two weeks' time at the most.

If too much primary air is used, the result will be that of a blasting effect upon the grate bars, which will cause an excess of heat to be produced for a short period after the fire has been cleaned, and from then on the clinker formation will commence. With this condition existing the production of furnace gas gradually diminishes from one fire cleaning to the other as the furnace conditions are continually changing. Thus satisfactory heats are not secured, and, as the saying goes, one is up a tree. The supply of secondary air remains constant, regardless of the variations in the furnace gas produced, with a result that part of the time there is too much secondary, and part of the time the reverse.

If the primary air is increased gradually in the manner previously stated, until the proper temperature is reached in the setting, one will have conditions under the proper control at all times, as the same conditions will continue throughout the 24 hours.

At this point it will not be out of place to describe the proper appearance of the fire in the furnace. It should be a very bright orange, but must not be allowed to reach the point of incandescence. An incandescent fire denotes a condition that should receive attention. Each individual piece of the fuel in the furnace should be easily recognizable.

Nothing has been said of the preheating of the primary air. The installation must be so designed that the primary air is heated to the highest point possible before it enters the furnace, which of course is done by utilizing the otherwise useless heat from the waste gases, which costs nothing and helps greatly. However, such matters are not within the scope of this paper and will therefore not be dwelt upon at length.

Secondary Air

As with the primary air, the secondary air ports must be so arranged as to permit the most minute adjustment and to assure perfect control. The correct adjustment of course can be made only with the Orsat and a sampling tank, but it is remarkable what efficient adjustments it is possible to make with the well trained eye by noting the condition of the waste gas flues. A good operator can come within a few per cent of correctness without the use of any instrument whatever, provided of course that he has become familiar with his particular installation through the previous use of chemical apparatus. An excess of oxygen will be noted by a dark flue while an insufficient supply will be recognized, if considerably deficient, by the blue flames. It frequently happens that there is sufficient secondary air to eliminate these blue flames, but still not sufficient to make combustion complete in the combustion chamber. When this condition exists there will be an excess of heat in the waste gas flues.

The color of these flues at a correct balance will depend of course upon the type of installation and the location of the point of observation. It is best to judge by the condition that prevails at a point where the waste gas has completed three-fourths of its travel. As previously stated, different installations will vary, but usually it is a medium red. Higher heats denote an insufficient supply of secondary air at the proper point and are frequently due to combustion taking place in the waste gas flues.

Of course the waste gas must be regularly analyzed and this subject is treated under the chapter dealing with Orsat tests.

Superheated Steam

The use of superheated steam in conjunction with a retort house furnace is very necessary and quite advantageous from many points of view. In making the installation sufficient capacity should be provided to supply a quantity of steam, at a pressure about half of that regularly carried on the boilers, equal to a little

more than pound for pound as compared with the generator fuel to be consumed. Actual practice should not require more than 75 per cent as many pounds of steam as fuel even with the most inferior grades, but it is well to have it available. Where the pressure to be carried is anticipated at only half or less of the boiler pressure, it will insure an ample and even pressure at all times regardless of the fluctuations at the boiler.

The steam heater should be installed in the form of a loop with good live steam pressure at each end. This will do much to eliminate wet steam and will insure uniform conditions at each and every unit. A first class regulator should be installed at each end of the loop for the pressure must not be allowed to vary one iota. The supply of primary, as before stated, is introduced by the injector effect of the steam, and of course if the steam pressure is allowed to vary, the supply of primary air will vary accordingly. One gauge at each end of the loop will be sufficient as the steam nozzles when properly constructed will all be the same.

The accompanying sketch "G" shows a good form of superheater.

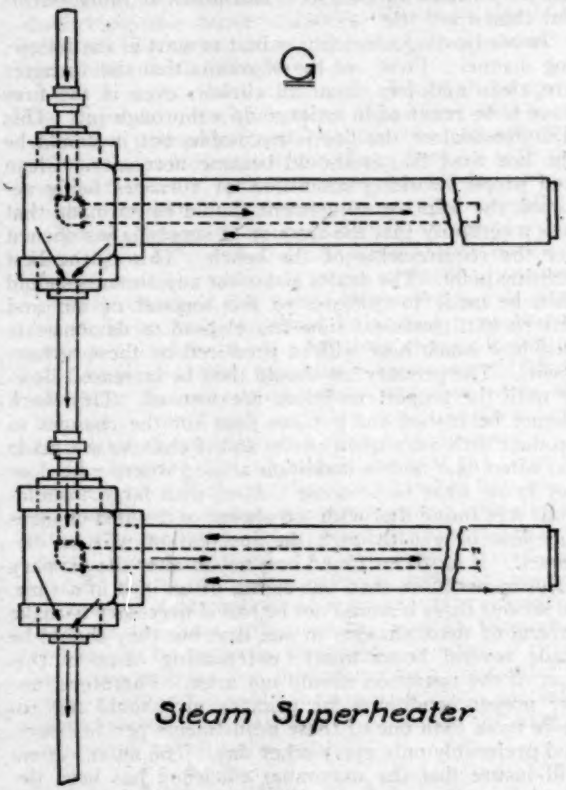
There are a good many types of superheaters and most of them are satisfactory. The one shown, however, in addition to being simple of construction is handily removed or replaced due to its compactness. There should be four of these to a bench; two on each side, one being placed above the other in such a manner that the steam will have to pass through them both before it enters the bench. Small installations will require less but it is well to assure ample superheating.

The nozzles, which are of course the points of exit for the steam, should all be the same length and should extend into the bench a distance necessary to secure the proper injector effect on the primary air. The openings in the ends of the nozzles should all be the same and they should be turned out with a lathe if possible to secure this point. One-quarter to three-eighths of an inch is a very good size for this opening. The pressure carried will be entirely dependent upon the quality of the generator fuel.

In balancing a bench one should start with an excess of steam and gradually lower it until the desired point is reached. It is well to start on the pound for pound basis and then if there are no clinkers and the bottom of the fire is too dead, the pressure can be gradually reduced until the proper amount is determined. Too much steam will deaden the fire at the bottom. An insufficient supply will allow the fuel to fuse on the grates causing clinkers. In regulating the amount of steam, it must be remembered that considerable hydrogen gas is produced from this source, and that point must receive careful attention. A very happy condition would be one wherein there were no clinkers, no excess of deal fuel upon the grates and about 10 per cent of hydrogen in the producer gas. The amount of hydrogen that can be produced in this manner is limited, and an excess of steam over and above the amount required for this limit will not only be wasted but will be a detriment to the operation of the bench.

In adjusting the steam pressure it must be remembered that each change will cast its reflection throughout the whole installation, and therefore all other adjustments will have to be rebalanced. This work is unquestionably a little tedious, but it must be remembered that the proper balancing of a bench is no small job, and that the gain to be derived will well repay the trouble. It is also expected that it will require some time, but under the system advocated in this paper, when once the proper balance is secured, there will be little trouble in the future.

It is the custom with many plants to use exhaust steam under grates, while some depend upon the old evaporator system. The latter type should be abandoned by all means, as it is practically useless in addition to being a constant source of annoyance. It is not worthy of discussion and the fewer words with which it can be condemned the better. The use of exhaust steam is more feasible, and in some circumstances does



Steam Superheater

very well. It appears like a waste of good money to use live steam in a place like this, but this is just another of those places where appearances are deceiving. With the best of fuel it may be possible to get enough steam with low pressure exhaust, but with the average condition it is not, and as previously explained, the steam has an injector effect upon the primary air and benefits very materially in the uniform control of the heats. So taking all things into consideration, live steam is unquestionably the best and should be used. It must always be borne in mind that retort house operation is the heart of the whole gas business and nothing should be spared that will contribute to its uniform and successful operation.

There is little to be said on this subject as this point has been covered in previous chapters. The only phase not having been touched upon is the matter of the temperatures to be maintained in the retorts. This will, of course, be dependent to a considerable extent upon the type of the installation and the capacity of the plant. Where there is sufficient capacity, it is well not to crowd the installation too much, for excess heats collect their toll from the residuals.

Another point and an important one is that when an installation is not working to its fullest capacity, should emergencies occur, one can readily increase the output temporarily. Also, of course, the more the installation is pushed the shorter will be its life. The above policy is quite good where the capacity is sufficient, but where the reverse condition exists it is not improper to push the installation for "all the traffic will bear," even at the expense of residuals, for the making of gas is our primary business and all other things of secondary importance. The life of the benches will be shortened, but the labor per "M" will be lower, and all things being considered the total cost of production will be less than if water gas is produced.

Coke

The handling of coke is a subject too large to be done justice in a paper of this nature, for it is a matter that presents sufficient material for thought and discussion to merit separate attention. Suffice to say at this writing that coke should be handled as gently as possible, being subjected to no unnecessary drops or rough treatment, and that it should be quenched and not drenched.

If possible, the discharging of coke from the retort should be done mechanically, as if done by hand it entails very hot and arduous labor. This point is worthy of discussion and the writer will invite discussion upon same at the conclusion of the reading of this paper.

Orsat Tests

Orsat tests are made in order to ascertain the quality of gas made, whether it be producer or waste gas. As before stated, a good operator can arrive at a very credible result with the unaided eye, but the Orsat is the final judge and must be used to secure the most efficient results. Theoretically, the producer gas should contain between 20 and 21 per cent of carbon monoxide where no steam is used, but in an efficiently operated plant this content runs as high as 25 and sometimes 26 per cent. There is also an average of from 7 to 10 per cent hydrogen. The extra percentages in the latter case are due to the action of the steam under the grates, as some of it is broken up into hydrogen and oxygen, the latter uniting with the carbon and forming carbon monoxide. There should be no carbon dioxide in the producer gas, but it is in actual practice impossible to eliminate it entirely. Its presence denotes one or more of several undesirable conditions. The fire is too thin, causing complete combustion in the furnace; the draft too heavy, causing the air to pass through the fire too quickly; or there are leaks above the fuel bed. A badly clinkered fire will cause the same condition, for what air passes through the furnace will rush up around the walls where it can overcome the resistance and will not have sufficient time of contact for the proper chemical reactions to take place.

With the waste gas there should be, theoretically, between 20 and 21 per cent of carbon dioxide and the remainder nitrogen, but this happy state of perfection never exists. A combined percentage of three of the oxygen and carbon monoxide is not considered a reflection upon the operator, for it is not always possible that all the molecules of the different gases will secure intimate enough contact with each other for their proper union. It very frequently happens that the total percentages of gases absorbed in the burrette does not reach the desired total of 21 as represented by the content of oxygen in the original air. This will be usually found to be due to a hydrogen content, which, of course, will not show in the Orsat test. This condition can be safely taken for granted and the secondary air correspondingly increased. Check tests should then be made.

The proper system for securing a sample of gas is by the use of a sampling tank, drawing a continuous sample throughout the entire period from one filling of the generator to another. With this system it is better to use the same water over and over again, as fresh water will absorb carbon dioxide to some extent.

Where a sampling tank is not used it has been found that the proper time to take a sample is at least one hour after the fire has been cleaned and half-way between the times at which the furnace is refilled. This will give the most uniform condition and will eliminate the sampling tank, which, though not cumbersome in a small plant, would entail a hardship in a large installation.

The furnaces must be refilled at intervals not to exceed three hours if desirable conditions are to be maintained.

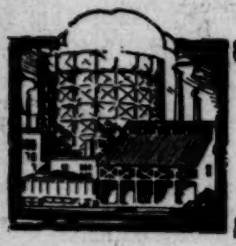
One Orsat test a week should be sufficient. This test should always be made at the same point. Where there are four waste gas exits, as there frequently are, it would only add to unprofitable confusion to test each individual outlet. As all secondary air ports are open the same amount, it is reasonable to suppose that if all passages are kept clean the same condition will prevail at all outlets. Tests are usually taken at a point where the waste gas has completed about three-fourths of its travel to its outlet.

Inspection

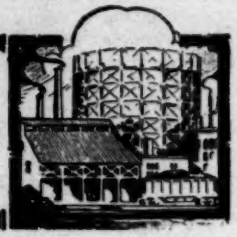
This subject concludes the paper. It is the last but by no means the least important. A retort house is very much like an infant that is just learning to walk. It requires constant care and guidance if its life is to be without mishap. Therefore it becomes absolutely compulsory to completely inspect the plant thoroughly each and every day. This work can, however, be systematized in such a manner that it can be gone over thoroughly in a relatively short time. One should start in at the hydraulic main each morning and go thoroughly over each and every function of the operation. It is far best to take no one's word for anything but to see to it yourself. This is one of the points that is often neglected. Going out and asking the foreman, "Well, Bill, how is everything this morning?" will not suffice, no matter how conscientious Bill may be. It is up to the operator himself to decide if all is well, and he must see conditions himself to judge properly.

A complete and concise record should be kept of all adjustments.

Once a bench has been properly adjusted, one should be extremely cautious about making changes. If it were operating properly and conditions otherwise arise, it is certain that something has gone wrong, and the thing to do is to locate the trouble and remedy vert to normal.



NEWS OF THE GAS INDUSTRY



Office Men in Seattle Company Volunteer Stokers During Strike

Gas workers in the plants of the Seattle (Wash.) Lighting Company are out on strike. Until the company was able to get strike-breakers in, the office men of the company were volunteer stokers, stoking the fires at six plants in an effort to keep up the service. The management of the company states that it was as much surprised by the suddeness of the strike as any of its patrons were. The company was utterly unprepared for the emergency.

When the strike was called some of the big retorts cooled down, others were packed with coal and coke clinkers, and production slowed down.

Production probably is not more than 80 or 85 per cent now.

The gas-holding tanks are not filled and there is little prospect of their being filled until the demand lessens. The new force of strike-breakers has been unable to catch up . The big tanks on West Lake and the holding tanks at the Lake Union Works are far down and thousands of gas users in the outlying districts don't get enough for cooking. Only on the hill-tops where the gas naturally rises, has there been any regular supply since the strike.

Superintendent Hutchinson declared the company is gradually overcoming the shortage, gaining slowly, but he said in answer to questions by Public Service Commissioner Spinning, that even without a gas strike, and with the old experienced crew on the job, it would have been difficult to supply gas during the stay of the Pacific fleet, which has been holding a celebration in Seattle.

The shipyards are large consumers of the city's gas; they were compelled to stop most of their compressed air work with the outbreak of the strike at the request of the gas company. The air machines are run by engines driven by fuel gas.

Hurried installations of coal and wood stoves in many Seattle restaurants and the purchase by housewives of hundreds of small electric plates and ranges have solved, temporarily, the gas shortage caused by the strike.

Splendid Lively Meeting Held by Michigan Gas Association

The Michigan Gas Association held their annual meeting in Detroit, Mich., at the Hotel Statler, on Sept. 17 and 18. It was considered the biggest and best meeting the association has had. President Ball made a timely address at the opening to a large attendance of the association's members. Affiliation of the Michigan Association with the A. G. A. was voted upon at this gathering.

One of the most interesting discussions was one on the coal and oil situations.

Michigan gas meetings have been noted for their spirit of good fellowship, and this year that the restraint of war times was removed was very evident. Old acquaintanceships were renewed and many new ones were formed, and for the few days everyone present seemed to forget about the daily grind and partook of the good things the entertainment committee provided, one of which was the splendid banquet held in the Detroit Athletic Club.

Golfers brought their sticks, so arrangements were made for them to play. The ladies, of course, were cordially invited. On Wednesday afternoon all went on an automobile ride through Grosse Pointe and along the shore of Lake St. Clair, with tea at the Detroit Country Club and a theatre party during the evening.

The business part of the meeting was in good hands. The papers read were live and timely. The one, "Retort House Operation," by Carl B. Wyckoff, is reported in this issue of the JOURNAL. Others included "Recent Developments in Gas Coals," by Harry J. Hood; "The Radiant-fire," by W. M. Blinks, and others. All roads seemed to lead to Detroit on Sept. 17, and about every gas man in the U. S. A. was invited.

N. Y. Consolidated Company Asks to Be Assessed for Taxes at Its Own Valuation of Its Property

Considerable interest on the part of realty owners is being manifested as to the probable attitude of the city and State toward the offer made by the Consolidated Gas Company to have the value of the real estate used in its gas business accepted by the city and State as the value of which it is assessed for purposes of taxation.

This offer by the company was made in the action now being heard in the United States District Court to test the validity of the present eight-cent gas law. The company believes that its real estate is worth considerably more than the millions at which it is assessed.

Notwithstanding the rate of inequality fixed by the State Board of Equalization as indicating the excess of sale value over assessed value of real estate in New York City, and the fact that it believes its real estate to have a value substantially in excess of the amount at which it is assessed, the company has expressed its willingness, in order to expedite the case, to accept the assessed value, under a stipulation that its acceptance by all parties would be without prejudice to their right to claim any other value in any other proceedings.

By-Products Coke Companies Affected by Steel Strike

By-products coke companies in the Chicago district involved in the giant steel strike include the Federal furnace plant of the By-Products Coke Corporation of South Chicago, which has 700 employees, and the East Chicago plant, which has 500 employees. About 35,000 employees of the Illinois Steel Company at the plants at Gary, Milwaukee, South Chicago and Chicago are affected by the strike, and 2,000 men in the Steel and Tube Company of America at the Indiana Harbor plant, and 800 in the Evanston plant.

President Daly Has Orders Not to Accept Contracts or Franchise Proposals

"I have been instructed by my board of directors not to entertain proposals for new contracts or franchises in northern Ohio cities, at least at the present time," Martin B. Daly, president of the East Ohio Gas Company, announced.

"That may mean," he explained, "that Cleveland and other northern Ohio cities will not have natural gas after the present franchises expire on Feb. 1, 1921. The situation may demand such action.

"I believe that the directors are considering seriously plans for substituting manufactured gas for the natural supply here. Long preparations for this change are necessary and it is not too early to begin.

"This action, I know, has not been taken simply as a means to enforce higher prices. It is necessary to conserve the supply of gas which, as everyone knows, is beginning to approach exhaustion.

"If Cleveland loses natural gas for its homes it will of necessity lose it for its industries at the same time. There will be no preference shown to large private consumers anywhere."

Operation of Holmesburg, Pa., Company Affected by Prohibition

Prohibition has brought not only dryness but darkness in its wake to residents of Tacony and Bridesburg, Pa.

The two sections have been forced into darkness through the lack of inmates in the House of Correction at Holmesburg, Pa., which operates a gas plant and supplies the neighboring towns.

Insufficiency of light, causing complaints from gas consumers, elicited the statement from the authorities that so few inmates have been received since the "dry" spell that there is an insufficient number to operate the gas plant.

Test Well Brought In

The Palo Duro test well in Amarillo, Tex., has been brought in and is reported to be making at this time something like 30,000,000 ft. of gas. The derrick was almost completely demolished when the drill was blown from the well. This well is about 900 ft. deep.

Conditions Changed—Increase Petitioned Inadequate

Since the Public Service Gas Company filed a petition in July for an increase of 18 cents a 1,000 cu. ft., conditions have arisen that make the amount inadequate. Thomas N. McCarter, president, told the public utilities commissioners to-day. Unless greater financial aid is given, he said, northern Jersey will be without gas.

Rather than add a further amount to the rate, he suggested that the board allow the company to ignore its amortization fund for a period, thereby providing three cents a cubic foot more than the company can use for operating expenses.

Gas Well "Running Wild" for Sixty Days Under Control

The Texas Company has brought under control the gas well eight miles north of Eastland, Tex., which has been running wild for sixty days and wasting a production of 100,000,000 cu. ft. a day. The company's natural gas department is laying a 4-inch line to this gasser from its 6-inch high pressure line for a distance of 10,000 ft. The company also is laying 6,003 ft. of 6-inch pipe line from another high pressure line for about ten miles east of Eastland.

In addition the company's gas department is getting ready to distribute gas in Ranger for domestic purposes. It has 90 miles of high pressure line in operation through which gas is distributed in Albany, Moran Parks, Cisco, Putnam, Abilene and Eastland for domestic purposes. Two hundred oil well drillers in Stephen and Eastland counties are supplied with fuel from the company's lines at this time. Thirty gas wells are connected up with the lines. An important extension of the high pressure will be announced later.

Meter Thieves Reported in Springfield, Mass.

Gas meter robbers are operating extensively in the city of Springfield, Mass., according to the reports which have been made to the Springfield police. Three reports were made to the police in one day of breaks which had occurred and a considerable number of reports have been made of breaks in one week. Householders have been warned by the Springfield Gas Light Company to look out for these thieves and not to allow ready access to their meters to anyone except the authorized agents of the company.

These meters, known as the "quarter meters," were broken open with a chisel. The money was extracted and the coin boxes removed, evidently for the purpose of taking a mold with which to have a key made. Thus far the Springfield Gas Light Company, which reported the breaks, has been unable to state its loss.

Every police officer on post has been notified to be on the lookout for the "quarter meter robbers" and detectives have been assigned to the case. The police believe from the nature of the breaks and the short space of time in which they have been made that all were perpetrated by one gang.

Personal Notes

HARRY E. MARSHALL, formerly right-of-way agent of the Public Service Company, of Chicago, died in Detroit on Aug. 4. Mr. Marshall, as right-of-way agent of the company, was instrumental in securing the right of way on which some of the earliest transmission lines were built, and was also active in the New Business Department of the Public Service Company of Chicago when the Evanston territory was added to the system.

ISAAC T. HADDOCK, who for some years has been virtually in charge of the gas making at the Cambridge (Mass.) Gas Light Company, has been appointed superintendent to succeed John P. Kennedy.

GEORGE L. ASHLINE, assistant purchasing agent and general storekeeper of the Public Service Company of Chicago, has resigned and will be succeeded by Henry M. Reid.

MILES CONNOR, a foreman in the street department of the Boston Consolidated Gas Company, has been named a director of the company to represent the profit-sharing employees. Mr. Connors is 46 years old and has been in the company's employ 23 years.

GEORGE R. JONES has been elected assistant to John H. Gulick, vice-president of the Public Service Company of Chicago. Mr. Jones has been connected with the Public Serv-

ice Company of Chicago for more than ten years, the greater part of which he has served in the capacity of purchasing agent. He will be succeeded by Albert E. Legge, an employee of the Commonwealth Edison Company. Mr. Legge has for twenty-five years been identified with the Commonwealth Company and its predecessor, the Chicago Edison Company.

Death of John P. Kennedy

John P. Kennedy, superintendent of the Cambridge Gas Light Company of Cambridge, Mass., died on Sept. 9, after an illness of seven weeks' duration. Mr. Kennedy was born at Wye, Md., March 21, 1873, and his early life was spent at Charlestown, W. Va. He was graduated from Stevens' Institute in 1896, and subsequently spent some tight or ten years service with Messrs. Humphreys and Glasgow in Europe, manufacturers of gas instruments. He was appointed superintendent of the Cambridge Gas Light Company in March, 1907.

Death Claims Henry Keyes

Henry C. Keyes, president of the Sacramento Gas Company, which he organized as the Sacramento Natural Gas Company in 1896, died Sept. 14, after an active business career of many years in Stockton and Sacramento, Cal.

Mr. Keyes was born in London, Ont., Can., May 12, 1852, where he grew up and received his education. He came to the States in 1868, joining a surveying party as rodman on the Alabama and Chattanooga, now the Alabama and Great Southern Railroad. Subsequently he secured a position in the service of the Chicago and Northwestern Railroad Company, with which company he remained until 1876, when he came to Placer County, Cal., where he spent three years in mining.

During his later years, in Stockton, Cal., he organized the Citizens National Gas Company of Stockton, the affairs of which he managed for 15 years.

Then followed the organization of the local gas company of Stockton and his removal to the Sacramento city in 1899. He developed the natural gas wells in Sacramento and established a service that is a big business factor and the only competitor of the Pacific Gas and Electric Company.

In fraternal circles Mr. Keyes was an Elk, Mason and a prominent Odd Fellow. He was also a member of all the Scottish Rite bodies of Sacramento up to the thirty-third degree, and a member of Islam Temple, N. M. S., of San Francisco.

Wilfred A. Jodoin Receives Farewell Gift

Officers and employees of the Brockton (Mass.) Gas Light Company presented Wilfred A. Jodoin, manager of installation for the past 15 years, an easy chair as a token of their esteem. J. B. Anderson, assistant manager of the company, made the presentation speech.

Mr. Jodoin left the Gas Light Company Sept. 1 to enter a new business undertaking. Mr. Anderson's speech was as follows:

"Much as everybody here would like to speak, it is necessary to delegate some person to voice the sentiments of all who have been associated with you during these years.

"There is in this assembly a sentiment that I cannot possibly express. It is divided between the personal loss which we all feel and the knowledge that you are bettering your condition.

"We have seen trying times together, but through it all your unfailing courtesy and fairness have without exception won our admiration.

"In your new business venture you will succeed. We are assured of this, because we know your methods will be the same as you have employed here. You will be fair to both your customers and your employees.

"We are unwilling that you should leave us without a permanent reminder of our esteem and affection, and to that end we hope you will accept this gift, which is prompted by the universal wish to be remembered as your friends."

Construction Notes

$35,000 Water Gas Plant Building in Oneida, N. Y.

George Guyette, local superintendent of the Adirondack Electric Power Corporation, of Oneida, N. Y., stated that he has been advised from the main office of the corporation at Glens Falls, N. Y., that a new gas plant had been ordered built in the city of Oneida, N. Y., by the corporation. The new plant will cost upwards of $35,000. The contract has been awarded to the American Gas Construction Company. The work will be started as soon as the necessary equipment and material arrive. It is not expected, however, that the new plant will be in operation before early next spring.

The new plant will be the "water gas type" with a capacity of making 20,000 cu. ft. of gas an hour. The installation of this type is the most modern known to science.

Hoffman Heater Company Erecting New Building to Meet Increase Capacity Demand

The Hoffman Heater Company, of Lorain, Ohio, manufacturers of all kinds of gas-fired water heaters, has let a contract for a new building, the dimensions of which will be 400 ft. by 100 ft. The increasing demand for the company's product has made it necessary for it to increase its capacity. The building will be cement foundation, steel, brick and glass construction. When completed this will be one of the most complete water-heater factories in the world.

The general office will occupy about 2,200 sq. ft.; in the rear of the office will be a print shop which will cover 600 sq. ft. The private office and director's room will be commodious, occupying 1,400 sq. ft. The shipping platform will occupy 3,000 ft. A japanning room of 1,400 ft. will care for the castings as they are received from the foundry. The heater and boiler room will be located in the rear of the building, and will occupy about 800 sq. ft. Six thousand feet of space will be devoted to stock; the machine shop will cover 3,600 sq. ft.; the assembling room 2,500 sq. ft.; the crating and lumber room 2,700 sq. ft. Ample space has been provided for a testing room. Immediately in the rear of the office will be a show room in which will be displayed a heater of every type manufactured by the company. Modern machinery has been purchased and is en route and will be installed as rapidly as received. Railroad sidings are already in place.

The company hopes to be in this new building by the first of the year.